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able phyletic sequence of families, therefore is as follows: "Gleicheniaceae, Cyatheaceae (with minor groups, e.g., Woodsieae, etc.), Aspidieae."

Miss HUME[25] has investigated the sieve tubes of *Pteridium aquilinum*, and compared them with those of *Lygodium dichotomum* and *Marsilia quadrifolia*. The xylem has long received intensive study on account of its service in conclusions concerning phylogeny; but there are symptoms that the phloem is now beginning to come into its own. The stock contrasts between the sieve tubes of pteridophytes and spermatophytes are now beginning to break down and Miss HUME has contributed her share to this process. Not only does callus appear, as RUSSOW showed, but the author shows that the pores are not closed. "The outstanding differences are in shape and contents; the sieve tubes of vascular cryptogams are larger and thicker walled and contain refringent granules." The larger size and thicker walls are thought to be associated with the fact that the sieve tubes of pteridophytes (on account of the absence of secondary thickening) have to function for a long time, in some cases for as much as 20 years, while in some dicotyledons and gymnosperms they are renewed each year. The time is at hand when the sieve tubes can be linked up in phyletic sequences as the xylem elements have been.

THOMAS[26] has discovered in the Jurassic of Yorkshire sporangia of *Coniopteris hymenophylloides* Brongn. and *Todites Williamsoni* Brongn., which support the view that the former species is closely related to the modern Cyatheaceae, and which furnish for the latter species additional points of resemblance to the modern *Todea*. Fertile material of *Cladophlebis lobifolia* Phill. was also secured, which justifies its removal from the form-genus and its provisional placing in a new genus *Eboracia*, related in sori and spores to *Coniopteris*, but very distinct in the form of the fertile fronds.—J. M. C.

American cecidology.—All students of the biological sciences will be interested in the increased attention which cecidology is receiving in America, and also in the fact that it is being studied by both entomologists and botanists. FELT presents four papers. In the first[27] he gives a very complete list of plants on which the cecidia of our American gall midges are known to occur and the names of the gall-makers. Our knowledge of this group of gall-makers is very indefinite, and therefore the very brief one-line descriptions may appear unsatisfactory to many who are unfamiliar with the subject. However, the list will prove of very great value to the student of plant pathology and cecidology. In a second paper[28] FELT describes 17 new species of gall midges, but many of them are not true gall-makers while others produce very small and insignificant galls. In a third paper[29] the same author describes three new species of dipterous gall-makers, and in the fourth[30] he describes four new species of gall midges from St. Vincent, West Indies. The development and structural characters of all these galls remains to be worked out by the botanist.

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[25] HUME, E. M. MARGARET, The history of the sieve tubes of *Pteridium aquilinum*, with some notes on *Marsilia quadrifolia* and *Lygodium dichotomum*. Ann. Botany **26**:573–587. *pls. 54, 55*. 1912.

[26] THOMAS, H. HAMSHAW, On the spores of some Jurassic ferns. Proc. Cambridge Phil. Soc. **16**:384–388. *pl. 3*. 1911.

[27] FELT, E. P., Hosts and galls of American midges. Jour. Econ. Entomology **4**:451–475. 1911.

[28] ———, New species of gall midges. *Ibid.* **4**:476–484. 1911.

BEUTENMÜLLER[31] has given us another most excellent paper on the North American galls. This last paper is on the genus *Dryophanta*, and contains excellent descriptions of both galls and insects of the 39 known species, with complete synonomy and bibliography. Most of the galls are figured, and all of them occur on oaks, but in a few cases the specific name of the host is not known. The 32 species for which the hosts are given are found on 24 species of oak. *Quercus rubra* leads with 7 species, *Q. alba* has 5, *Q. coccinea* has 4, *Q. undulata*, *Q. velutina*, and *Q. nana* have 3 each, *Q. arizonica*, *Q. marylandica*, *Q. prinoides*, *Q. palustris*, and *Q. laurifolia* have 2 each. *Dryophanta palustris* is found upon 7 different hosts, *D. lanata* on 5, *D. notha* on 3, 5 other species on 2 each, and 24 species on 1 each.

The same author[32] also describes and figures two new species of *Holcaspis* galls from Mexico. These papers will be absolutely necessary for students who wish to make botanical studies of cecidia.

One of the most interesting and important contributions to American cecidology is by ERWIN F. SMITH,[33] who has continued his studies on crown gall of plants, and presents some interesting comparisons with the cancer of human beings. The similarity between plant and animal malformations has attracted the attention of many observers, who have looked upon the study of plant galls as a fruitful field of investigation, but unfortunately very few have gone into it far enough to see the real possibilities. SMITH'S confidence in this line of work is expressed as follows: "I believe we have in these particular plant overgrowths a key to unlock the whole cancer situation. In consideration of these discoveries many closed doors in cancer research must now be opened, and studies on the etiology of the disease must be done over with a view to finding a parasite within the cancer cell, and separating it therefrom by an improved technic of isolation." In answer to his critics he claims that the crown gall is not the same as a granulomata of the animal. He also shows that the tendency of the human cancer to form secondary growths by means of strands of tissue is similar to the formation of secondary growth of the crown gall, and believes that "we have in the crown gall a striking analogy to what occurs in malignant animal tumors." He does not claim that the animal cancer and crown gall are due to the same organism. The latter part of the paper is devoted to physiological characters of the organisms and presents some suggestions which will be of importance to the plant physiologist who has the courage to attempt to explain the formation of plant cecidia as a result of irritation by parasitic fungi and insects.—MEL T. COOK.

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[29] FELT, E. P., Three new gall midges. Jour. N.Y. Entom. Soc. **19**:190–193. 1911.

[30] ———, New West Indian gall midges. Entomol. News **23**:173–175. 1912.

[31] BEUTENMÜLLER, WILLIAM, The North American species of *Dryophanta* and their galls. Amer. Mus. Nat. Hist. **30**:343–369. 1911.

[32] ———, Two new species of *Holcaspis* from Mexico. Psyche **18**:86, 87. 1912.

[33] SMITH, ERWIN F., On some resemblances of crown gall to human cancer. Science N.S. **35**:161–172. 1912.

Inheritance in flax.—TAMMES[34] has studied a number of characters in crosses between two varieties of the common flax (*Linum usitatissimum*) and between these and *L. crepitans* and *L. angustifolium*. She has dealt quantitatively with the length of seeds, length and breadth of petals, color of the flowers, degree of opening of the mature capsules, and the hairiness of the dissepiments of the capsules. Hairiness of the capsules and the lightest blue color of the flowers are each determined by a single Mendelian gene, but all the other characters are obviously more complex. The author believes that all of these characters are likewise determined by genes which segregate normally in the F_2, though they cannot be followed individually because several genes affect the same characteristic and act together in such a way that the grade of development of the character depends approximately on the number of these genes present. This results in a continuous series of gradations which are superficially indistinguishable from fluctuations, but which differ by being inheritable. Several evidences for the correctness of this interpretation are reported: The F_1 is in each case intermediate between the parents and no more variable than they; in the F_2 the variability is considerably increased, and the curves stretch out toward those of either parent, but frequently fail to reach them owing to the small size of the families investigated; when F_3 families are grown from the extreme variants of the F_2, a still closer approach to one or the other P_1 results, apparent identity with the parental type being attained in several cases. From the proportion of F_2 and F_3 families which approached in any given characteristic the condition of the P_1 generation, Miss TAMMES estimates the number of genes probably involved in differentiating the two parental types in each cross with respect to the several characteristics studied. She concludes that in length of seeds not less than four differentiating genes were involved in every cross made, in some crosses certainly a still larger number. In width of petals the simplest cross must have had differences between the parents in 3 or 4 genes, and the other crosses a considerably higher number. In flower-color different intensities of blue were apparently dependent on three genes. Between capsules which remain closed at maturity and those that spring wide open, 3 or 4 genes are involved. Later generations will be needed fully to test these conclusions.—GEO. H. SHULL.

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[34] TAMMES, T., Das Verhalten fluktuierend variierender Merkmale bei der Bastardierung. Recueil Trav. Bot. Neerlandais **8**:201–288. *pls. 3–5*. 1911.